

ANTIBIOTICS (lesson 4-5)

Read the article and complete the tasks that follow.

Common painkillers ibuprofen and paracetamol found to fuel antibiotic resistance

Ibuprofen and paracetamol are common over-the-counter medications that many of us reach for when we're sick. But new research from the University of South Australia shows that these trusted staples are quietly fuelling one of the world's biggest health threats: antibiotic resistance.

In the first study of its kind, researchers found that ibuprofen and paracetamol are not only driving antibiotic resistance when used individually but amplifying it when used together.

Assessing the interaction of non-antibiotic medications, the broad-spectrum antibiotic ciprofloxacin, and *Escherichia coli* (E. coli) – a common bacteria that causes gut and urinary tract infections – researchers found that ibuprofen and paracetamol significantly increased bacterial mutations, making E. coli highly resistant to the antibiotic.

It's an important finding that has serious health implications, particularly for people in aged care homes, where multiple medications are regularly administered.

The World Health Organization reports that antimicrobial resistance is a global threat to public health, and that bacterial resistance was directly responsible for 1.27 million global deaths in 2019.

Lead researcher UniSA's Associate Professor Rietie Venter says the findings raise important questions about the risks of polypharmacy in aged care.

"Antibiotics have long been vital in treating infectious diseases, but their widespread overuse and misuse have driven a global rise in antibiotic-resistant bacteria," Assoc Prof Venter says.

"This is especially prevalent in residential aged care facilities, where older people are more likely to be prescribed multiple medications – not just antibiotics, but also drugs for pain, sleep, or blood pressure – making it an ideal breeding ground for gut bacteria to become resistant to antibiotics.

"In this study we looked at the effect of non-antibiotic medicines and ciprofloxacin, an antibiotic which is used to treat common skin, gut or urinary tract infections.

"When bacteria were exposed to ciprofloxacin alongside ibuprofen and paracetamol, they developed more genetic mutations than with the antibiotic alone, helping them grow faster and become highly resistant. Worryingly, the bacteria were not only resistant to the antibiotic ciprofloxacin, but increased resistance was also observed to multiple other antibiotics from different classes.

"We also uncovered the genetic mechanisms behind this resistance, with ibuprofen and paracetamol both activating the bacteria's defences to expel antibiotics and render them less effective."

The study assessed nine medications commonly used in residential aged care: ibuprofen (an anti-inflammatory pain relief), diclofenac (an anti-inflammatory to treat arthritis), acetaminophen (paracetamol for pain and fever), furosemide (for

high blood pressure), metformin (for high sugar levels linked to Diabetes), atorvastatin (to help lower cholesterol and fats in the blood), tramadol (a stronger pain medication post-surgery), temazepam (used to treat sleeping problems), and pseudoephedrine (a decongestant).

Assoc Prof Venter says the study shows how antibiotic resistance is a more complex challenge than previously understood, with common non-antibiotic medications also playing a role.

Antibiotic resistance isn't just about antibiotics anymore. This study is a clear reminder that we need to carefully consider the risks of using multiple medications – particularly in aged care where residents are often prescribed a mix of long-term treatments. This doesn't mean we should stop using these medications, but we do need to be more mindful about how they interact with antibiotics – and that includes looking beyond just two-drug combinations."

Rietie Venter, UniSA's Associate Professor

Task 1. Below are four summaries of the article. Only one is accurate, concise, and well-structured. Read carefully and decide which is correct.

A.

The article explains that modern painkillers such as ibuprofen and paracetamol reduce the negative impact of antibiotics and make them more effective. In addition, it stresses that elderly people in residential care benefit greatly from taking several drugs at the same time. Therefore, the study suggests that combining antibiotics with painkillers could be a successful strategy to fight infectious diseases and to reduce the spread of resistant bacteria worldwide.

B.

The whole article looks more general than scientific, and the information is not very exact. It is about antibiotics and also some painkillers, but it does not explain very well what is really important. It says that these medicines make infections better and there are no serious problems with bacteria. In aged care homes many drugs are given, but this is presented as good for patients and not dangerous at all. Finally, the text finishes by saying resistance is not a very big issue, because new medicines will always be found quickly.

C. The article discusses new research showing that ibuprofen and paracetamol, two widely used painkillers, may fuel antibiotic resistance when combined with ciprofloxacin. Moreover, the findings highlight serious risks in aged care facilities, where polypharmacy is common and residents are especially vulnerable. Consequently, the study concludes that resistance is not caused only by antibiotics but also by everyday medicines, which has important implications for global health.

D.

The article talks about medicine and resistance, and it is very serious but not explained well. It mentions some drugs like ibuprofen and paracetamol, and also antibiotics, but the details are not clear or connected. There is also a part about elderly people and hospitals, but it does not say why they are important. At the end,

it only repeats that resistance is a big health problem, but it does not explain the reasons or results in detail.

Task 2. Read each statement carefully. Decide whether the statement is True (T) or False (F) according to the article.

1. The study proved that paracetamol kills viruses like influenza. **T / F**
2. The World Health Organization reported that over one million people died due to antimicrobial resistance in 2019. **T / F**
3. Antibiotic resistance is not a global issue; it affects only poorer regions. **T / F**
4. The researchers said that antibiotic resistance is not just about antibiotics anymore. **T / F**
5. Ibuprofen and paracetamol may fuel antibiotic resistance when combined with antibiotics. **T / F**
6. The antibiotic tested in the study was ciprofloxacin. **T / F**
7. The study used Escherichia coli (E. coli), which can cause gut infections. **T / F**
8. Painkillers made antibiotics more powerful against bacteria in the study. **T / F**
9. Polypharmacy means avoiding medicines altogether. **T / F**
10. Aged care homes are at high risk because residents often take multiple medicines. **T / F**

Task 3. Replace the underlined words/phrases with the correct expression from the box. Each word / phrase is used only once.

*fuel antibiotic resistance · trusted staples · amplify antibiotic resistance
gut infections · have serious health implications · aged care homes
vital in treating infectious diseases · breeding ground
exposed to ciprofloxacin · expel antibiotics · anti-inflammatory
render antibiotics less effective · assess medications · decongestant
over-the-counter medications*

1. In the experiment, bacteria were *put in contact with ciprofloxacin*.
In the experiment, bacteria were _____
2. Ibuprofen belongs to the group of *drugs that reduce inflammation and pain*.
Ibuprofen belongs to the group of _____
3. Antibiotics are *extremely important in fighting bacterial diseases*.
Antibiotics are _____
4. Using several medications at the same time may *cause very serious problems for human health*.
Using several medications at the same time may _____
5. When taken together, some drugs may *make bacteria even more resistant to antibiotics*.
When taken together, some drugs may _____
6. Doctors warn that mixing painkillers with antibiotics can *make the problem of resistance worse*. Doctors warn that mixing painkillers with antibiotics can _____
7. Aged care facilities can become a *place where dangerous bacteria can easily spread and grow*.
Aged care facilities can become a _____
8. Such resistance may *make antibiotics work less well*.
Such resistance may _____
9. Pseudoephedrine is a common *medicine that helps reduce a blocked nose*.
Pseudoephedrine is a common _____
10. Many elderly people live in *special facilities for old people who need constant care*.
Many elderly people live in _____
11. For many households, ibuprofen and paracetamol are *basic medicines people always rely on*.
For many households, ibuprofen and paracetamol are _____
12. Doctors in care homes must regularly *check all the medicines patients take*.
Doctors in care homes must regularly _____
13. Painkillers like ibuprofen and paracetamol are widely available as *drugs you can buy without a prescription*.
Painkillers like ibuprofen and paracetamol are widely available as _____
14. Some bacteria can *push antibiotics out of their cells* to survive.
Some bacteria can _____ to survive.
15. Ciprofloxacin is often prescribed for *illnesses caused by harmful bacteria in the intestines*. Ciprofloxacin is often prescribed for _____